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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/068,273	02/07/2002	Aravind Padmanabhan	H19 02237 US	4265

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HONEYWELL INTERNATIONAL INC.
101 COLUMBIA ROAD
P O BOX 2245
MORRISTOWN, NJ 07962-2245

EXAMINER	
VO, HAI	

ART UNIT	PAPER NUMBER
1771	

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/068,273	PADMANABHAN ET AL.	
	Examiner	Art Unit	
	Hai Vo	1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) *18-44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 45-49* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. Applicant's arguments, see the amendment, filed 04/12/2004, with respect to claims 1-17, and 45-49 have been fully considered and are persuasive. All the art rejections in the 11/01/03 Office Action have been withdrawn.
2. Applicant's arguments with respect to claims 10-17 and 45-49 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-12, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 200021905 in view of Gole et al (US 6,589,883). US 6,261,469 to Zakhidov et al is relied on as an equivalent form of WO 200021905. Zakhidov discloses a photonic crystal comprising a three-dimensionally periodic microporous structural matrix of interconnecting, crystallographically oriented, monodispersed members having voids between adjacent members, and members having randomly nanoporous surface porosity (figure 9). The photonic crystal composed of 250 nm SiO2 spheres (column 28, lines 51-52). Zakhidov discloses the members comprise surfaces or interfaces that are inverse replicas of the surface of a monodispersed sphere array, wherein necks exits between neighboring spheres in the sphere array and the average sphere diameter is from 20 nm to 100 nm (column 4, lines 20-25). Zakhidov reads on the claim

limitations (column 25, lines 18-27, and column 27, lines 65 et seq.) Zakhidov teaches the photonic crystal disposed on a surface of a silicon substrate (column 23, lines 21-24, column 25, line 20). Zakhidov discloses the article useful as a piezoelectric sensor (abstract). Zakhidov teaches the three dimensionally periodic photonic crystal having ability to bend light at curvatures for optical sensor applications (column 23, lines 50-55). Likewise, it is apparent that the three dimensionally periodic photonic crystal is light transmitting too. Zakhidov does not specifically the spheres comprising randomly nanoporous surface porosity. Gole, however, teaches a post etch treatment for enhancing and stabilizing the photoluminescence from a porous silicon (abstract). Gole also teaches the high surface area silicon formed through etching display a visible photoluminescence upon excitation with a variety of visible and ultraviolet light sources. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the etching treatment to the phonic crystal of Zakhidov motivated by the desire to stabilize and enhance the photoluminescence of the photonic crystals. This is important to the expectation of successfully practicing the invention of Zakhidov and thus suggesting the modification.

5. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 200021905 in view of Gole et al (US 6,589,883) as applied to claim 1 above, further in view of Russell et al (US 6,093,941). US 6,261,469 to Zakhidov et al is relied on as an equivalent form of WO 200021905. The discussion of

Zakhidov from above is repeated here. Zakhidov discloses the photonic crystal deposited on a diamond substrate (column 23, lines 27-30). Zakhidov does not specifically disclose the photonic crystal deposited on a sapphire substrate. Russell teaches a photonic band gap material can be deposited on a sapphire substrate (column 4, lines 25-28, figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ a sapphire substrate on which the photonic crystal is deposited motivated by the desire to obtain excellent transparency, flatness and chemical resistance (Russell, column 7, lines 23-25). This is important to the expectation of successfully practicing the invention of Zakhidov and thus suggesting the modification. It is apparent that Zakhidov as modified by Russell is using the same sapphire material to form a substrate for the photonic crystal, it is the examiner's position that the properties of the substrate set out in the claim would be inherently present. Like material has like property. This is in line with ***In re Spada***, 15 USPQ 2d 1655 (1990) which holds that products of identical chemical composition can not have mutually exclusive properties.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 200021905 in view of Gole et al (US 6,589,883) as applied to claim 1 above, further in view of Koops (US 6,064,506). Zakhidov is silent as to a liquid crystal imbibed on the photonic crystal. Koops teaches the cavities of photonic crystals filled with the liquid crystals to tailor the optical behavior of the photonic crystal to meet the desired needs (column 1, lines 53-55). Therefore, it would have been

obvious to one having ordinary skill in the art at the time the invention was made to fill the cavities of the photonic crystal with liquid crystal material motivated by the desire to tailor the optical behavior of the photonic crystal to meet the desired needs.

7. Claims 45, 46, 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 200021905 in view of Gole et al (US 6,589,883) and Jewell (US 5,617,445). The discussion of Zakhidov from paragraph no. 3 is repeated here. Zakhidov is silent as to a metal layer deposited on opposite surfaces of the photonic crystal. Jewell, however, teaches the photonic crystal comprising the top and bottom contacts 44, 46 made of silver or gold (column 6, lines 19-23). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit two metal layers on the opposite surfaces of the photonic crystal motivated by the desire to optimize the light transmitting through the photonic crystal.

With regard to claim 46, It is the examiner's position that the article of Zakhidov as modified by Jewell is only slightly different than the claimed article prepared by the method of the claim, because both articles are made of the same materials, having structural similarity (metal layer/photonic crystal/metal layer). Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or an obvious from a

product of the prior art, the claim is unpatentable even though the prior product was made by a different process. ***In re Thorpe***, 227 USPQ 964, 966 (Fed. Cir. 1985). The burden has been shifted to the applicant to show unobvious differences between the claimed product and the prior art product. ***In re Marosi***, 218 USPQ 289,291 (Fed. Cir. 1983). It is noted that if the applicant intends to rely on Examples in the specification or in a submitted Declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with Zakhidov/Gole/Jewell.

Zakhidov does not specifically disclose a light emitter positioned to direct light onto the photonic crystal. Jewell, however, teaches the photonic crystal comprising a light emitter 14, 16, 18, 20, and 22 positioned to direct light onto the photonic crystal (figure 1A). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the light emitter motivated by the desire to enhance the efficiency of the light emission.

The combination of Zakhidov, Gole and Jewell fails to teach the wavelength at which the article is operated. However, since the article of Zakhidov as modified Gole and Jewell meets all the structural limitations as set forth in the claims. The photonic device comprises a light transmitting photonic crystal which has a three dimensionally periodic microporous structural matrix of interconnecting, crystallographically oriented, monodispersed members having voids between adjacent members. The members has the nanoporous surface.

The device comprises the photonic crystal being sandwiched between the two metal layers. The member of the photonic crystal is made from silicon. Therefore, it is the examiner's position that the photonic crystal would inherently transmit the light at the wavelength within the claimed range. Like material has like property. This is in line with ***In re Spada***, 15 USPQ 2d 1655 (1990) which holds that products of identical chemical composition can not have mutually exclusive properties.

8. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 200021905 in view of Gole et al (US 6,589,883) and Jewell (US 5,617,445) as applied to claim 45 above, further in view of Koyama et al (US 6,462,356). Zakhidov fails to disclose an electrode attached to the electrically conductive and optically transparent layer. Koyama teaches a light emitting device comprising a pair of electrodes attached to the light emitting layers (column 1, lines 35-40). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use of the pair of electrodes attached to the light emitting layers motivated by the desire to apply an electric field to the light-emitting layer.

Response to Arguments

9. The art rejections over Zakhidov taken alone or in combination with Russell, Koops, Jewell and Koyama have been overcome by the present arguments. Zakhidov fails to teach or suggest the monodispersed member comprising the nanoporous surface porosity.

10. The art rejections over Ichimura have been overcome by the present arguments. Ichimura fails to teach or suggest that the photonic crystal comprises polymer spots having the nanoporous surface porosity. The polymer spots as disclosed in Ichimura is solid instead.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai Vo whose telephone number is (571) 272-1485. The examiner can normally be reached on M,T,Th, F, 7:00-4:30 and on alternating Wednesdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hai Vo
AU 1771
Technology center 1700